



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/737,133	12/15/2003	Hiroyuki Shinbata	1232-5235	6320
27123 7590 05/16/2007 MORGAN & FINNEGAN, L.L.P. 3 WORLD FINANCIAL CENTER NEW YORK, NY 10281-2101			EXAMINER SHIKHMAN, MAX	
			ART UNIT 2609	PAPER NUMBER
			MAIL DATE 05/16/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/737,133

Applicant(s)

SHINBATA, HIROYUKI

Examiner

Max Shikhman

Art Unit

2609

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12/15/2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>02/07/2005 11/26/2004</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. **The abstract** of the disclosure is objected to because it is incomprehensible.

In the first sentence, "maximize the contrast of an image after gray level conversion", it's unclear which image is being gray level converted.

The second sentence, "To accomplish this..." needs to be clarified. Steps need to be listed in forward order, not backwards. Please avoid long, drawn out, twisted, convoluted sentences, written backwards.

Correction is required. See MPEP § 608.01(b).

2. **The disclosure** is objected to because of the following informalities:

FIELD OF THE INVENTION is unclear. This sentence, "*a technique for executing gray level conversion processing on the basis of the contrast of an image after gray level conversion*", is incomprehensible. "Gray level conversion" is mentioned twice; what is the difference between them? Is the same image gray level converted twice? Applicant needs to clarify what is gray level converted and list steps in forward order. Avoid using the word "after".

SUMMARY OF THE INVENTION is unclear. Page 3, lines 20-27, "*defining means for defining a gray level conversion curve to be used for gray level conversion on the basis of a contrast of the image after gray level conversion of the radiographical image*". Please define the difference between "*image*" and "*radiographical image*". Also, is the first gray level conversion by an unspecified means, while the second gray level

conversion using a *gray level conversion curve*? Is this curve being used once or twice? Please list steps in forward order and avoid having to use "after".

Page 7, line 22, "*The analyzing circuit 114 defines a gray level conversion curve, with which the contrast of an image after gray level conversion is maximized, on the basis of the contrast of the image after gray level conversion.*" This sentence is unclear and should be rewritten. Please avoid using the word "after".

Page 10, Formula 4, is an integration of a discrete image function $f_1(x,y)$. This is puzzling. A discrete function should not be integrated over, but summed as $\sum \sum$.

Formula 4 should be a double summation instead of a double integration.

Two sentences on pages 3 and 12 are now discussed. Page 3, Column 5, "*Conventionally, the contrast is adjusted by trial and error while visually confirming it. There are no objective indicators representing the suitability of the contrast.*"

Page 12, line 2, "*When the parameters d and c are simultaneously changed to calculate optimum parameters D and C , an optimum gray level curve shape can be decided.*"

Applicant needs to clearly specify how to calculate the optimum D and C ; how is applicant's way better than "*by trial and error while visually confirming it*". Also, applicant needs to clearly specify whether the contrast enhancement is done in analog or digital domain.

Appropriate correction is required.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. **Claim 8** is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

In Claim 8, "An image processing program" is being recited; however, an image processing program would reasonably be interpreted by one of ordinary skill in the art as software, per se. This subject matter is not limited to that which falls within a statutory category of invention because it is limited to a process, machine, manufacture, or a composition of matter. Software is a function descriptive material and a function descriptive material is non-statutory subject matter.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. **Claims 1,7,8,9** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Applicant is asked to please clarify the following.

() Regarding Claims 1,7,8,9:

The limitation, "*a gray level conversion curve to be used for gray level conversion on the basis of a contrast of the image after gray level conversion of the radiographical image*", in Claims 1,7,8,9, lacks enablement. Specification failed to provide step-by-step technical information on how to make *a gray level conversion curve to be used for gray level conversion on the basis of a contrast of the image after gray level conversion of the radiographical image*, which is the limitation recited in Claims 1,7,8,9. Applicant needs to clearly specify how to calculate the optimum D and C using formula 4; so that D and C can be plugged into formula 3. Applicant needs to specify how to find Dmax and Dmin.

() Regarding Claims 8 and 9:

Claims 8 and 9 imply that a computer program is going to automatically figure out *a gray level conversion curve to be used for gray level conversion on the basis of a contrast of the image after gray level conversion of the radiographical image*. Automatic gray-level conversion is not disclosed in the specification.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. **Claims 1-9** are rejected under 35 U.S.C. 102(b) as being anticipated by Rafael C. Gonzalez, "Digital Image Processing, 2/E" (ISBN-10: 0201180758, Published: 11/09/2001). Gonzalez discloses as follows.

() Regarding Claim 1:

An image processing apparatus which executes image processing for a radiographical image obtained by converting, into an electrical signal, an intensity distribution of radiation that is radiated to an object and has passed through the object, comprising: defining means for defining a gray level conversion curve to be used for gray level conversion on the basis of a contrast of the image after gray level conversion of the radiographical image;

(Page 77 Figure 3.2, and Page 78 Figure 3.4, show gray level transformation for contrast enhancement.

Page 80, Figure 3.5, formula 3.2-3.

Page 85, Figure 3.10. Page 91, Figure 3.16. Pages 101-102, Figures 3.21 and 3.22)

and gray level conversion means for converting a gray level of the radiographical image by using the gray level conversion curve defined by said defining means.

(Page 78, Figure 3.4, shows gray level transformed image.

Page 80, Figure 3.5, formula 3.2-3. Figures 3.6-3.8)

() Regarding Claim 2:

The apparatus according to claim 1, wherein said defining means defines the gray level conversion curve on the basis of a contrast improvement factor defined by the gray level conversion curve.

(Page 80, Figure 3.5, formula 3.2-3. Figure 3.6 shows various curves.)

() Regarding Claim 3:

The apparatus according to claim 2, wherein to define the gray level conversion curve, the defining means calculates the contrast improvement factor by fixing the contrast of the gray level conversion curve and translating the gray level conversion curve on a coordinate system whose abscissa represents an input pixel value and whose ordinate represents an output pixel value.

(Pages 80-81, Figure 3.6, formula 3.2-3. Figure 3.6 shows various curves.

Formula 3.2-3 can do the translation only by changing b: $s = c(r + \varepsilon)^{\gamma} - b$.)

() Regarding Claim 4:

The apparatus according to claim 2, wherein to define the gray level conversion curve, the defining means calculates the contrast improvement factor by changing the contrast of the gray level conversion curve and translating the gray level conversion curve on a coordinate system whose abscissa represents an input pixel value and whose ordinate represents an output pixel value.

(Pages 80-81, Figure 3.6, formula 3.2-3. Figure 3.6 shows various curves.

Formula 3.2-3 can do the translation by changing b and contrast by changing γ :

$$s = c(r + \varepsilon)^{\gamma} - b$$

() Regarding Claim 5:

The apparatus according to claim 1, wherein said defining means defines the gray level conversion curve on the basis of the contrast of a specific image region of the object after gray level conversion.

(Page 85, Figure 3.10. Page 91, Figure 3.16. Pages 101-102, Figures 3.21 and 3.22.)

() Regarding Claim 6:

The apparatus according to claim 1, wherein said defining means defines the gray level conversion curve on the basis of the contrast of a predetermined region of the object after gray level conversion.

(Page 85, Figure 3.10. Page 91, Figure 3.16. Pages 101-102, Figures 3.21 and 3.22)

() Regarding Claim 7:

An image processing method of executing image processing for a radiographical image obtained by converting, into an electrical signal, an intensity distribution of radiation that is radiated to an object and has passed through the object, comprising: an analysis step of defining a gray level conversion curve to be used for gray level conversion on the basis of a contrast of the image after gray level conversion of the radiographical image; and

(Page 77 Figure 3.2, and Page 78 Figure 3.4, show gray level transformation for contrast enhancement.

Page 80, Figure 3.5, formula 3.2-3.

Art Unit: 2609

Page 85, Figure 3.10. Page 91, Figure 3.16. Pages 101-102, Figures 3.21 and 3.22)

a gray level conversion step of converting a gray level of the radiographical image by using the gray level conversion curve defined in the analysis step.

(Page 78, Figure 3.4, shows gray level transformed image.

Page 80, Figure 3.5, formula 3.2-3. Figures 3.6-3.8)

() Regarding Claim 8:

An image processing program

(Book's name is "Digital Image Processing", meaning all formulas can be executed in digital form on a computer.

Page 94, Section 3.3.2 discloses histogram equalization done automatically. Histogram equalization improves the contrast.)

which executes image processing for a radiographical image obtained by converting, into an electrical signal, an intensity distribution of radiation that is radiated to an object and has passed through the object, characterized by causing a computer to execute: an analysis step of defining a gray level conversion curve to be used for gray level conversion on the basis of a contrast of the image after gray level conversion of the radiographical image; and

(Page 77 Figure 3.2, and Page 78 Figure 3.4, show gray level transformation for contrast enhancement.

Page 80, Figure 3.5, formula 3.2-3.

Art Unit: 2609

Page 85, Figure 3.10. Page 91, Figure 3.16. Pages 101-102, Figures 3.21 and 3.22)

a gray level conversion step of converting a gray level of the radiographical image by using the gray level conversion curve defined in the analysis step.

(Page 78, Figure 3.4, shows gray level transformed image.

Page 80, Figure 3.5, formula 3.2-3. Figures 3.6-3.8

Figure 3.22b mentions using iterative procedure on Page 99 in Equation (3.3-17).

Page 94, Section 3.3.2 discloses histogram equalization done automatically.)

() Regarding Claim 9:

A storage medium which stores an image processing program

(Book's name is "Digital Image Processing", meaning all formulas can be executed in digital form on a computer.

Page 94, Section 3.3.2 discloses histogram equalization done automatically. Histogram equalization improves the contrast.)

which executes image processing for a radiographical image obtained by converting, into an electrical signal, an intensity distribution of radiation that is radiated to an object and has passed through the object, wherein the image processing program causes a computer to execute: an analysis step of defining a gray level conversion curve to be used for gray level conversion on the basis of a contrast of the image after gray level conversion of the radiographical image; and

(Page 77 Figure 3.2, and Page 78 Figure 3.4, show gray level transformation for contrast enhancement.

Page 80, Figure 3.5, formula 3.2-3.

Art Unit: 2609

Page 85, Figure 3.10. Page 91, Figure 3.16. Pages 101-102, Figures 3.21 and 3.22)

a gray level conversion step of converting a gray level of the radiographical image by using the gray level conversion curve defined in the analysis step.

(Page 78, Figure 3.4, shows gray level transformed image.

Page 80, Figure 3.5, formula 3.2-3. Figures 3.6-3.8

Figure 3.22b mentions using iterative procedure on Page 99 in Equation (3.3-17).

Page 94, Section 3.3.2 discloses histogram equalization done automatically.)

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Stark discloses (Image Processing, IEEE Transactions on), "Adaptive image contrast enhancement using generalizations of histogram equalization".

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Max Shikhman whose telephone number is (571) 270-1669. The examiner can normally be reached on Monday-Friday 7:30AM-5:00PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shuwang Liu can be reached on (571) 272-3036. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2609

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Max Shikhman
4/24/2007



SHUWANG LIU
SUPERVISORY PATENT EXAMINER